NWS/WR Science and Technology Infusion Division (STID)

Fire Weather/HRRR Smoke

Andy Edman
JPSS Conference
Aug 28, 2018

Fire Weather/HRRR Smoke

Key Points:

- Madison Sat Conf – world is changing
  - Value of sat obs based on their impact to modeling – this project is a good example
- Great teamwork
  - Improved FRP + HRRR upgraded with aerosols –> HRRR Smoke
- FY18 Summer fire season optimal for smoky fires
  - Deep unstable layers – weak transport winds
- R&D project – but WFO and Public acceptance very good
  - HRRR animations very successful

Fire Weather/HRRR Smoke

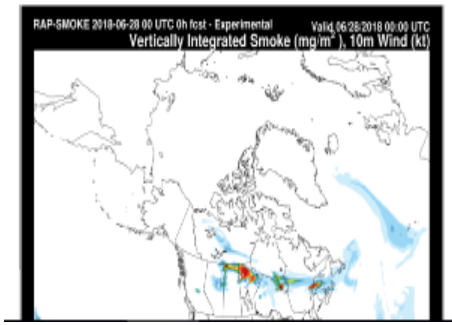
New Series – Highlight emerging new science tools to improve IDSS messaging and community impacts

Major upgrades to HRRR Smoke

With the fire season starting, there are some important improvements to thw developmental HRRR smoke effort, based partially on WR Feedback.

Key Points:

- The largest scale for smoke assimilation has been expanded to include Alaska, Canada and Mexico. This will better capture fire events over North America where the smoke drifts down into the CONUS - **see domain below**
  - Special thanks to Chris Gibson (SOO- Missoula) and Ron Miller (SOO-Spokane) for their feedback last year on this issue, it did have an impact!!
  - The EPA was also very interested in this capability as the HRRR represents the next generation aerosol modeling capability and smoke affects community air pollution attainment far downstream of the fires
- How does this work? As a reminder, the RAP model provides the background initial conditions to the hourly 3km CONUS HRRR
  - **Link to the RAP based smoke -** https://rapidrefresh.noaa.gov/RAPsmoke/
  - **Link to the HRRR Smoke CONUS -** https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/
- How does this capability compare with some of the other smoke options?
  - The HRRR Smoke uses the satellite based Fire Radiative Power (FRP) to acquire the location of active fires. Most other smoke models rely on the smoke being detected by ground aerosol observing systems. In essence the HRRR is the next generation approach to data assimilation and modeling -- much like how the HRRR data assimilates radar data to better capture thunderstorm activity. Both of these efforts are a work in progress!
  - ***Adding aerosol information will also improve other forecast elements, like temperature and precipitation forecasts***
  - The HRRR will be part of the NBM Blend
    - These changes are making their way into each HRRR operational upgrade -- first baby step this summer
    - These changes are also informing decisions about what physics will be included in the new NCEP FV3
- A special note: The Hawaiian volcano makes for an interesting test. The FRP relies on the size and intensity of the heat signature. **The FRP algorithm knows nothing about volcanic lava flows**, it just detects a very intense heat signature. So while the volcano is not producing that much smoke, it is useful test for an extreme high end heat event.
- Feedback requested: As we start another fire weather season your feedback is always appreciated and does have an impact



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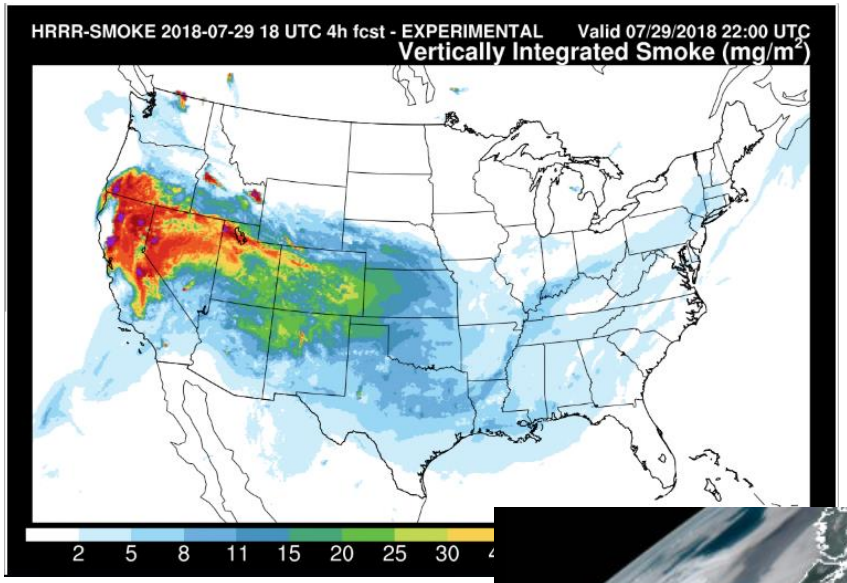

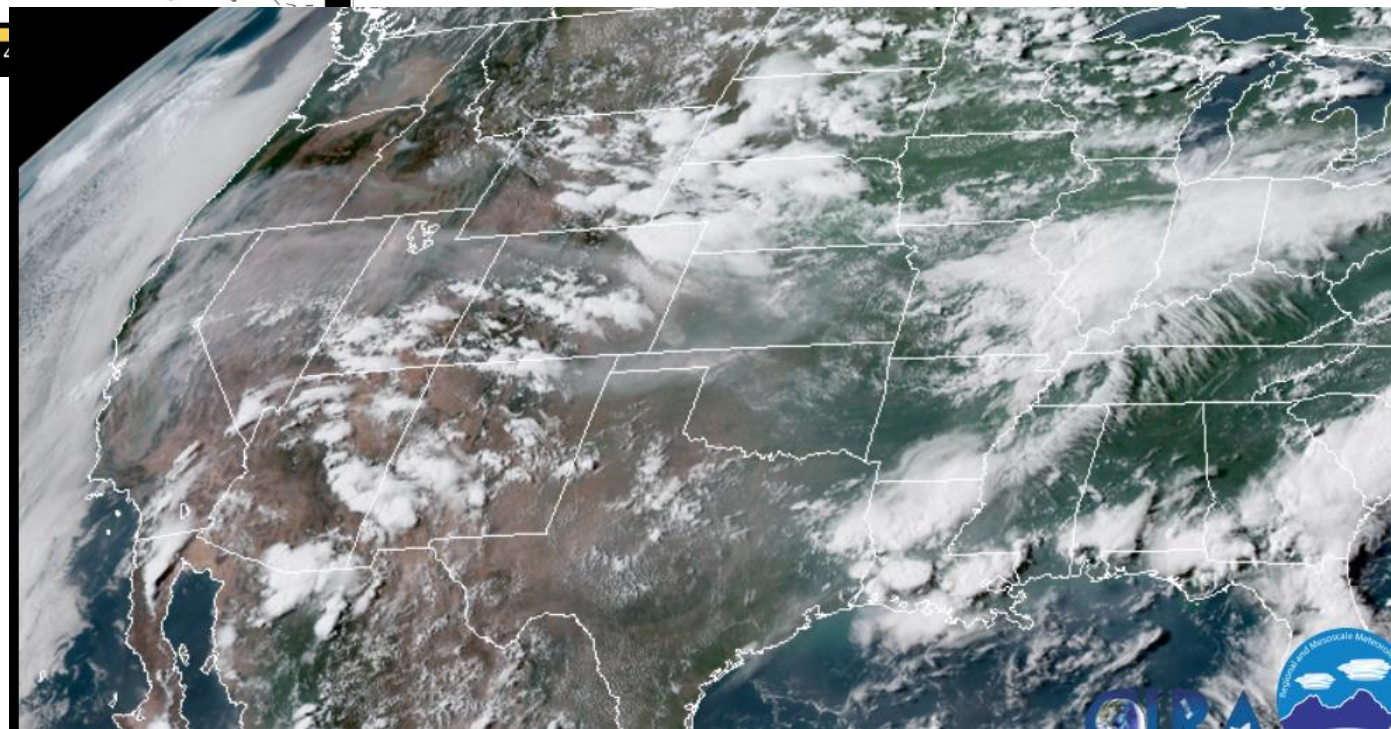

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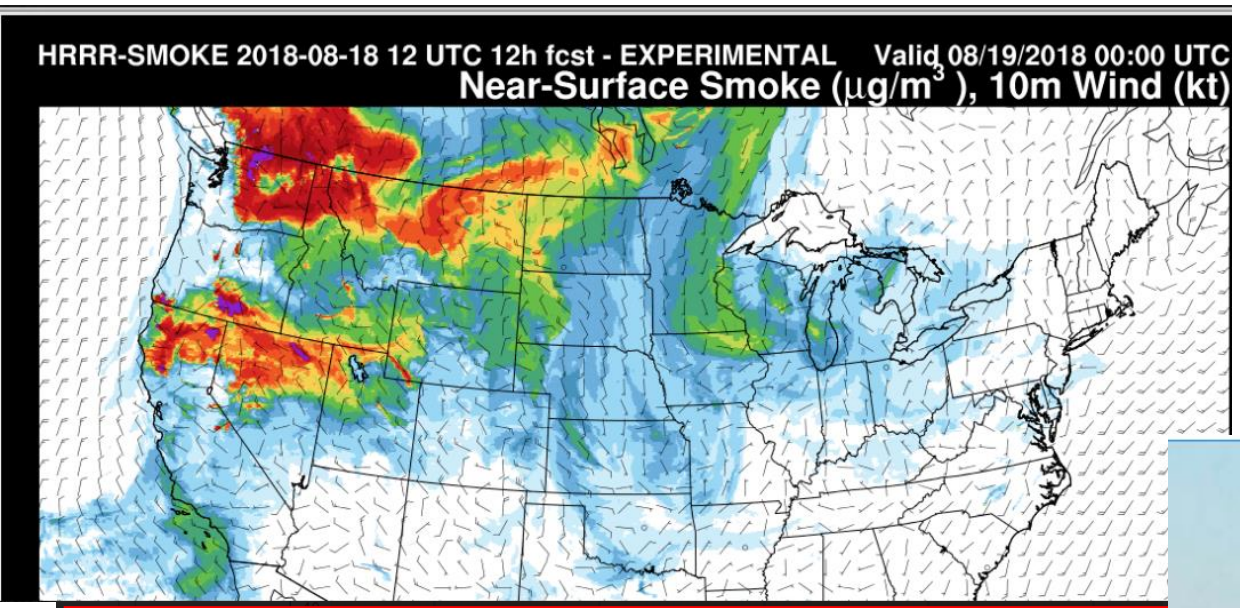
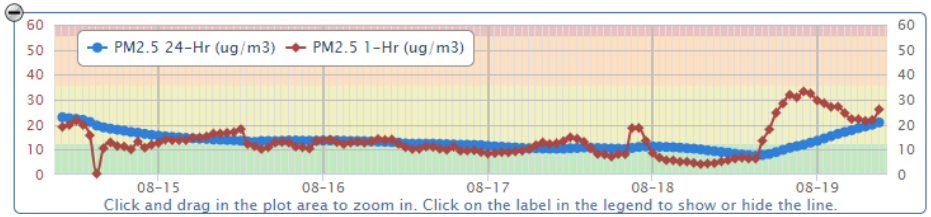
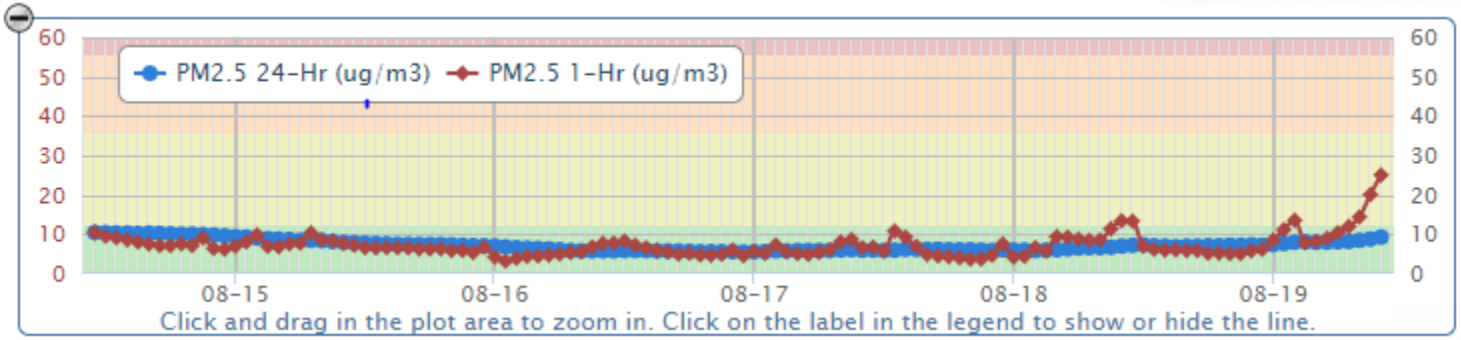


Last Updated: August 19, 2018 9:00 AM
(Data Not Quality Assured)





Fire Weather/HRRR Smoke

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HRRR smoke DSS messaging examples from last day(ish) -- note WAVE was used for many of the graphics

https://www.facebook.com/NWSSacramento/videos/1828276113875055/

https://www.facebook.com/NWSHanford/videos/2069315783143888/

https://www.facebook.com/207213322649399/posts/1759572954080087/

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https://www.facebook.com/157117197683462/posts/1895386443856

https://www.weather.gov/lkn/

https://www.weather.gov/rev/

US National Weather Service Hanford California
July 17

High resolution smoke model showing the likely areas to be affected by fire from the Ferguson Fire. It should be noted the model assumes the fire remains constant, producing a continuous supply of smoke.

7.7K Views

24 Likes 14 Comments 88 Shares

Fire Weather/HRRR Smoke

It just rained, so why is it so smoky?

By Lexi Nielsen, KSL.com | Posted - Aug 23rd, 2018 @ 5:44pm

26

10PM: It just rained, so why is it so smoky?
KSL TV

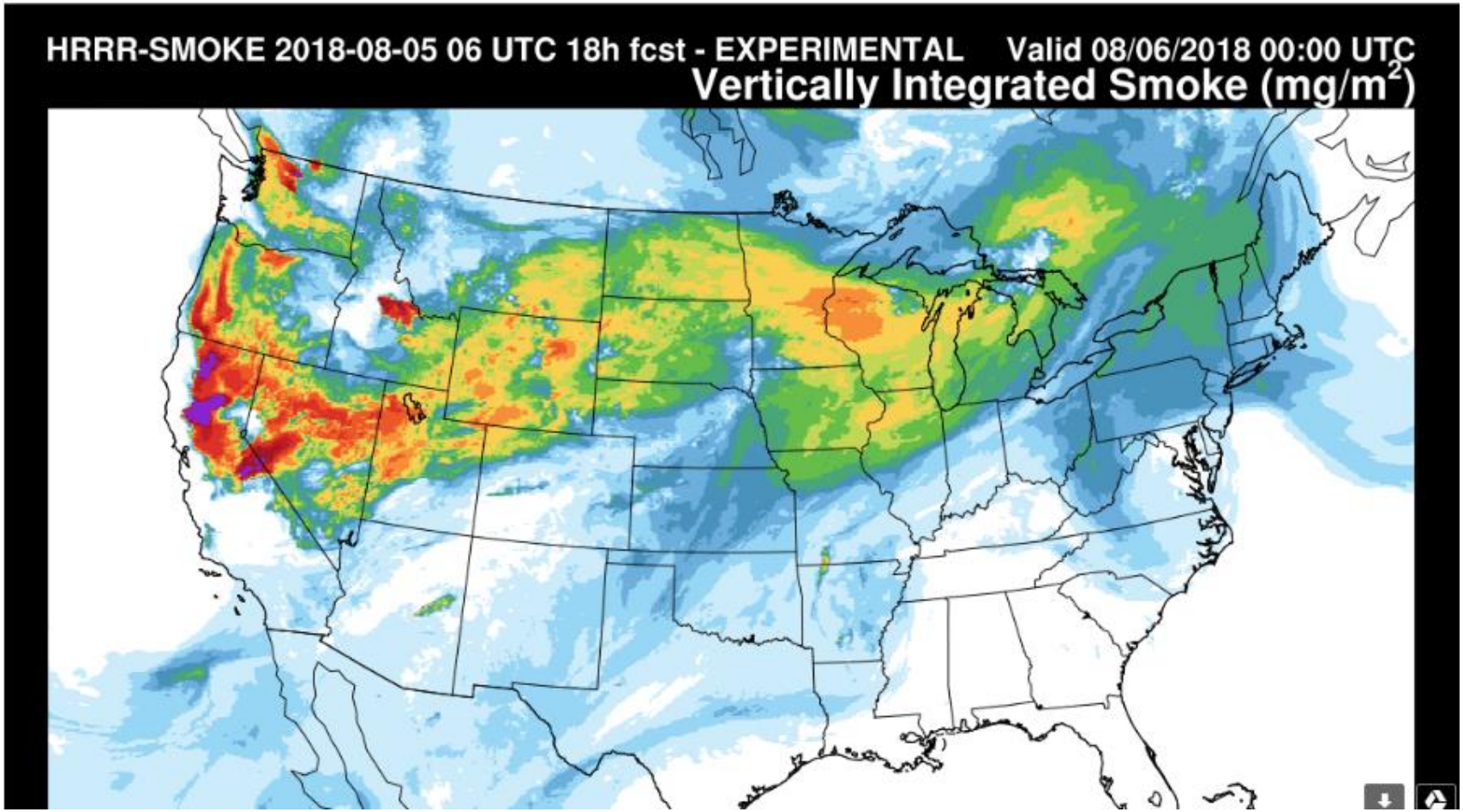
Show 2 more videos

SALT LAKE CITY — Heavy August storms rolled through Utah Wednesday but left behind something a little puzzling: smoke.

Those hoping to finally see clear skies may have to wait a little longer. The front that brought the rain to the Beehive State also brought smoke from California and Oregon, according to a Facebook post from the Utah Department of Environmental Quality.

As the smoke plume settled, the air quality in most areas throughout the state remained moderate, but Tooele, Herriman, Rose Park and Weber County moved into the "unhealthy for sensitive groups" range. The department urged those with lung conditions to stay inside.

Fire Weather/HRRR Smoke



Fire Weather/HRRR Smoke

NOAA – National Weather Service
Interior Northern California – Sacramento CA
www.weather.gov/sacramento

Elevated Fire Weather; Poor Air Quality This Week

Updates are Highlighted

Impacts

- Potential rapid spread of fires
- Poor air quality for sensitive groups from wild fire smoke

Forecast Confidence

- High

Timing and Strength

- **Fire Weather**
  - fire weather Thursday through Saturday evening
    - Increasing onshore flow will result in winds 15 to 20 mph (Updated)
    - Wind gusts up to 30 mph, mainly for canyons and ridges (See WindGusts.png)
    - Isolated thunderstorms possible over the Coastal Range Friday afternoon and evening (Updated)
- **Smoke** (See HRRR_Smoke.gif)
  - As fires continue to burn, smoke will continue to fill interior northern California
    - Areas of smoke will increase with fire activity from the Carr and Mendocino Complex fires
- **Temperatures** (See MaxT_Loop.gif)
  - Today-Thursday: Not as hot, temperatures return to near or slightly above normal

Weather Summary

Area wildfires continue to bring smoky conditions across northern California, especially in the vicinity of the Carr and Mendocino Complex fires.
Temperatures are expected be near or slightly above normal into the weekend. Critical fire weather concerns for ridges and canyons Thursday through Saturday evening as winds increase with onshore flow. Monsoonal moisture spreading north over the Coastal Range may cause isolated thunderstorms late afternoon and evening Friday.

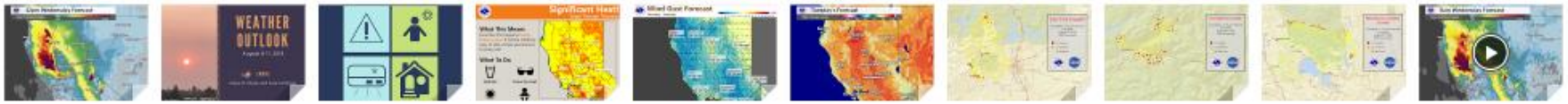
NWS will continue to provide updates as the situation develops.

Please do not reply to this email, rather contact NWS Sacramento at (916) 979-3045 for 24x7 forecaster assistance (please keep non-public)

Monitor NWS Sacramento Facebook, Twitter and Weather.gov for further updates.

You can help us by becoming a Weather Ready Nation Ambassador!
(Click the WRN icon below for more information)

10 Attachments



Fire Weather/HRRR Smoke

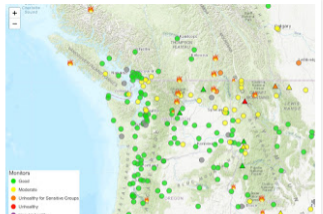
Cliff Mass Weather and Climate Blog

This blog discusses current weather, weather prediction, climate issues, and other topics

Sunday, August 26, 2018

Rain, Better Air Quality, And the End of Major Heat Waves for Perhaps the Rest of the Summer

With the upper level trough passage today, increasing onshore flow and rain has greatly cleaned up the air over the [illegible] region. In fact, as shown in the figure, the air quality over the Northwest hasn't been this good in months (green is t

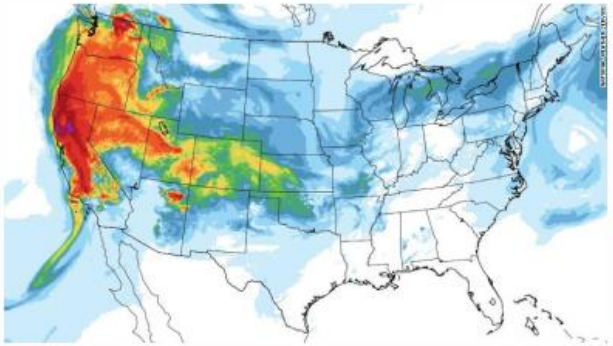


CNN U.S. + Crime + Justice | Energy + Environment | Extreme Weather | Space + Science — Live TV — U.S. Edition +

Smoke from the California wildfires is spreading 3,000 miles to New York City

By Jessica Campisi and Haley Brink, CNN

Updated 8:33 AM ET, Fri August 10, 2018



More from CNN

Obama: Hawaii Little League world champions 'make America very...

North Carolina federal court throws out congressional map

(CNN) — Take a look at this forecast model from the National Weather Service. It shows how the smoke from the wildfires scorching California is traveling thousands of miles. In this case, all the way to New York City -- about 3,000 miles away.

The weather service uses an experimental model that forecasts the spread of smoke from wildfires across the country. It says winds lift the smoke up and carry it across the US. And it doesn't stop there -- some of the particles move even beyond the East Coast.

Eos - Earth and Space Science News • 17/08 09:20

How Forecasting Models Are Changing the Way We Fight Fires

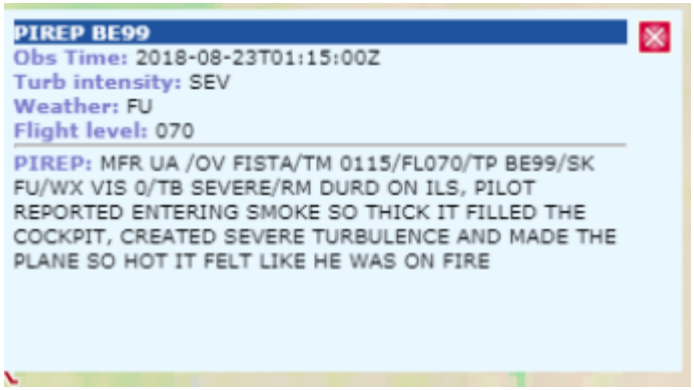
Eos speaks with Andy Edman, western region chief of the Science and Technology Infusion Division at the National Weather Service, about how the agency is helping wildfire crews fight fires from space.

Fire Weather/HRRR Smoke

The WR large airports were busy yesterday due to weather issues.

- SEA had 89 delays due to wildfire smoke and haze in the morning
- SFO had an all day GDP from low CIGs. 307 delays, 7 aircraft holds for 128 minutes and 37 diversions
- PHX had 53 delays and 5 diversions due to thunderstorms

Smoke and haze caused a 6.5 hour GDP at **SEA** that lasted until early afternoon. There were 158 delays.



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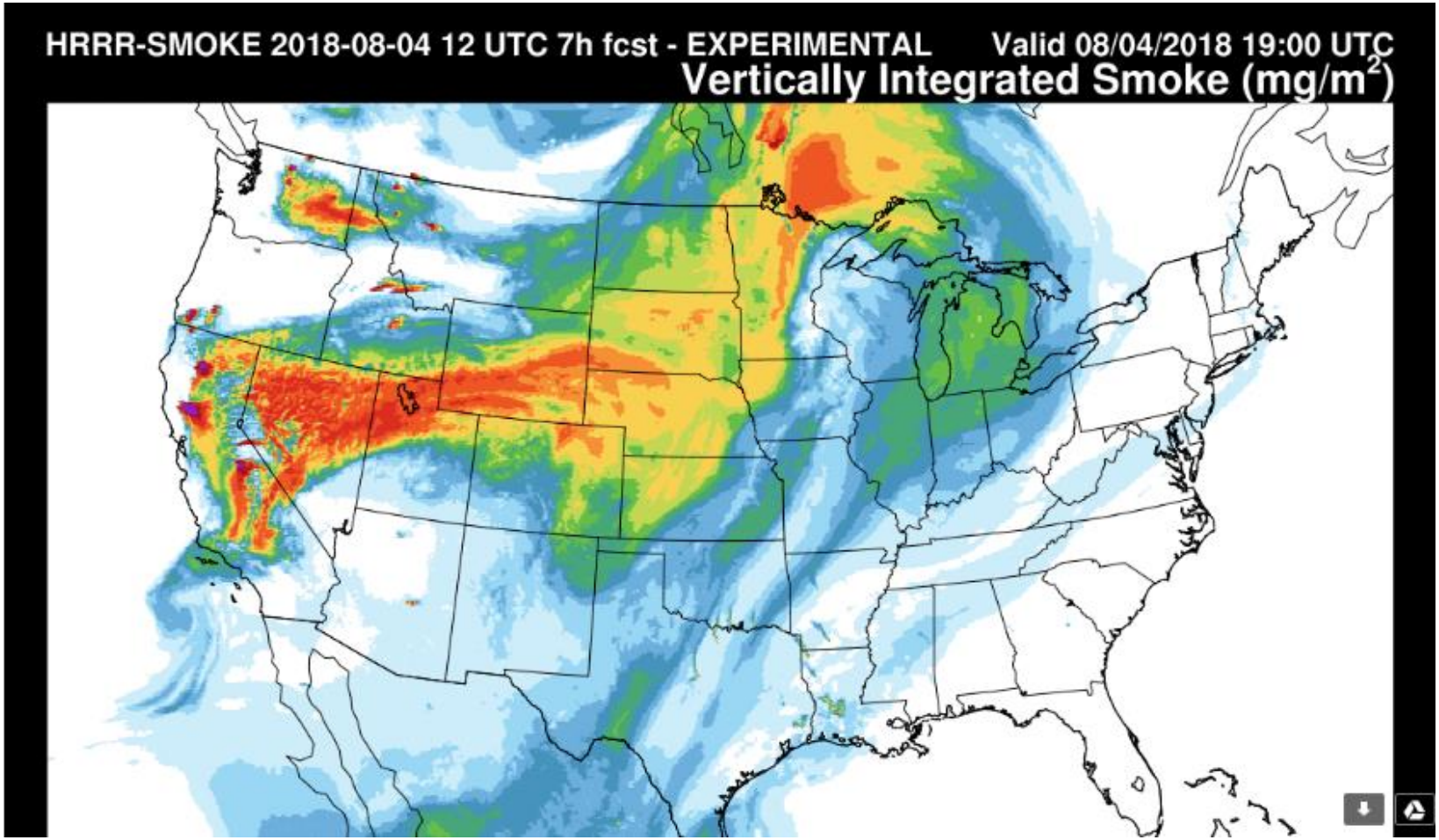

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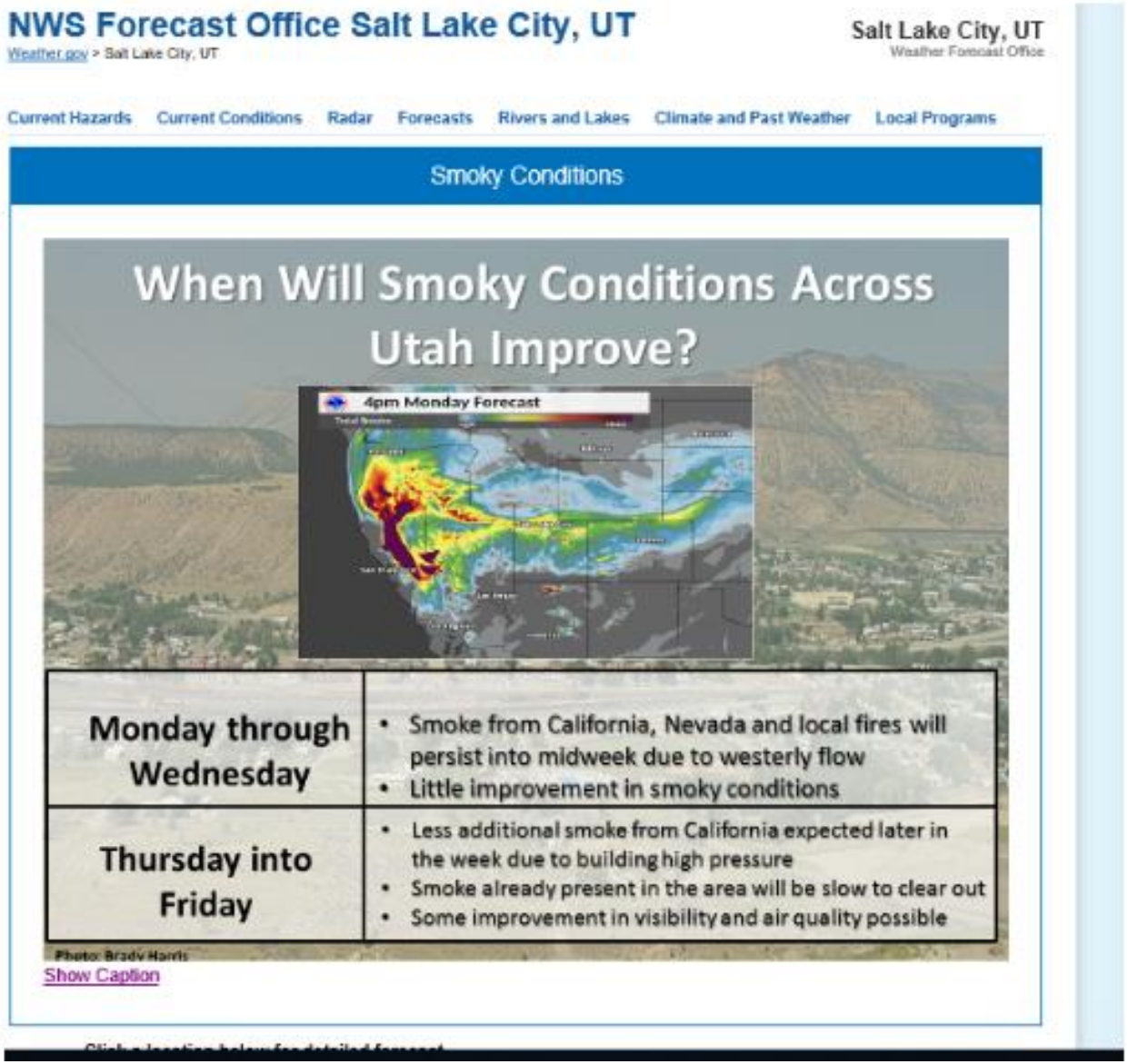

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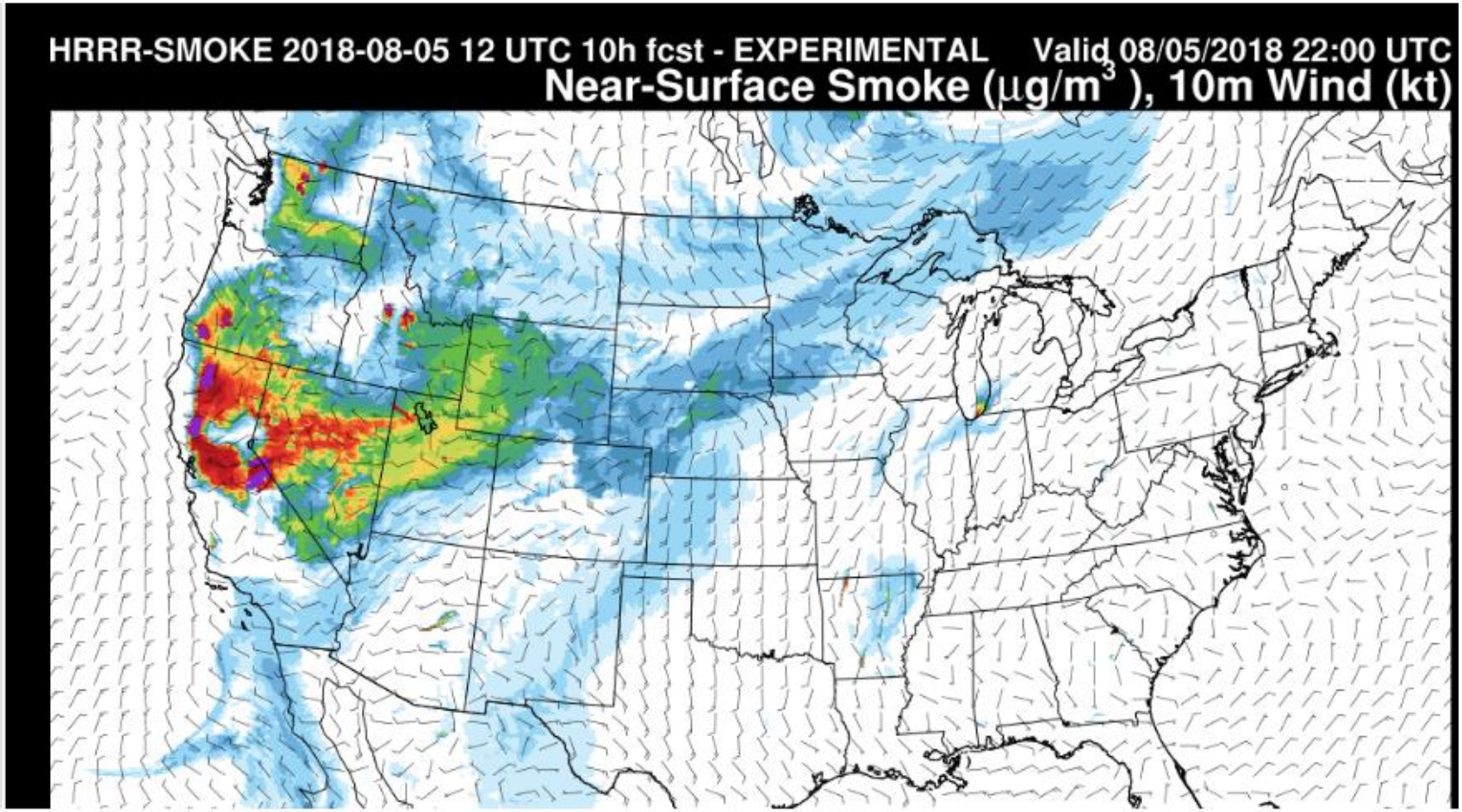

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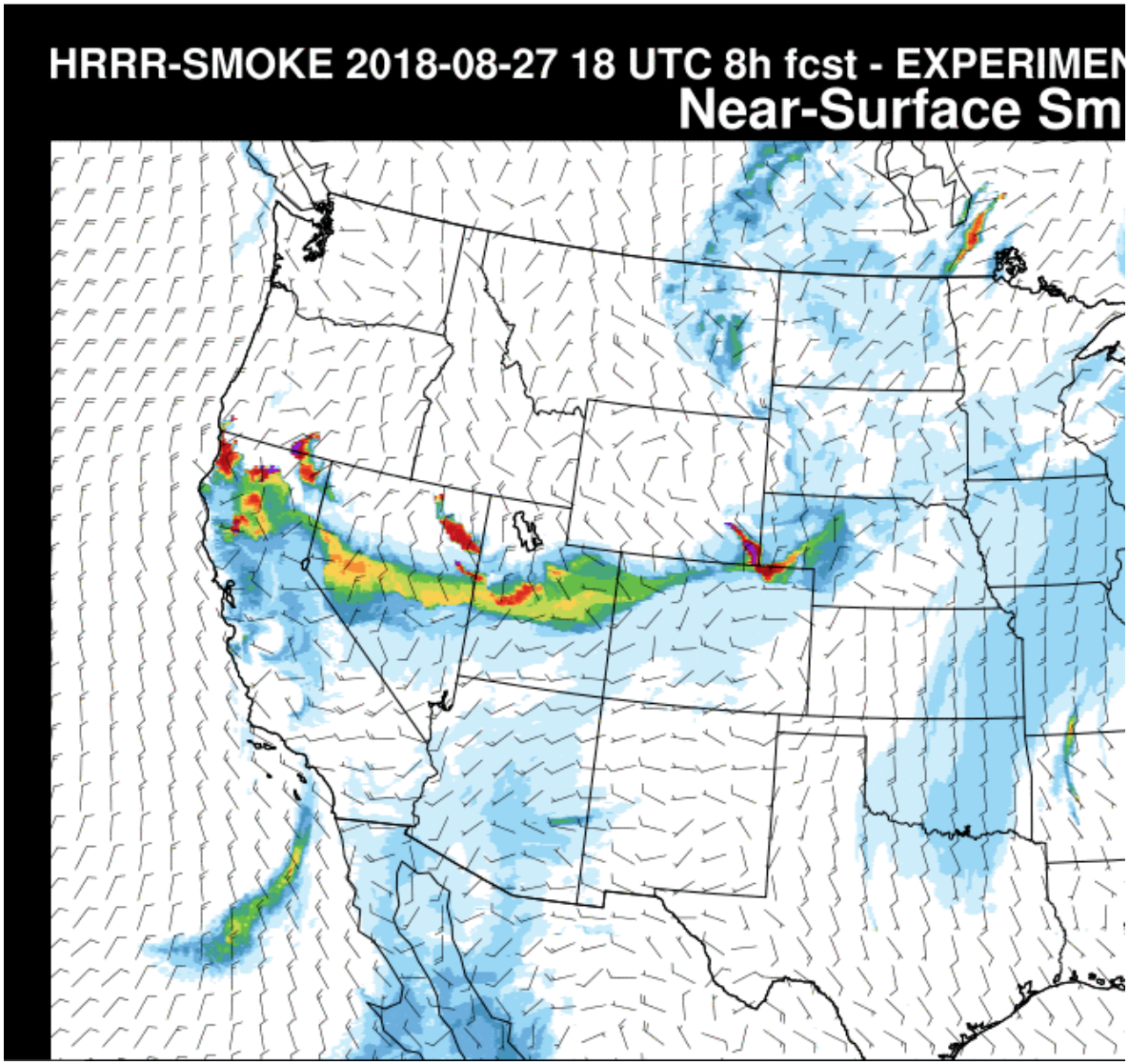

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- FRP and HRRR-Smoke enhancements were significant
  - 36 hour 3km animations are a huge selling point !!!!!
  - Fires from Mexico, Canada and Alaska in RAP really helped
  - Fire location/intensities were better
  - OAR many model improvements really helped
  - Reduced downtime helped with forecaster trust
  - Helped with FV3 physics planning
  - Used WAVE to make displays
- Still and R&D project
  - Smoke from Canadian fires a challenge
  - More verification and tuning

Fire Weather/HRRR Smoke

Summary

- Science
  - HRRR Smoke shows how event will evolve
    - Organizations/people interested
  - Smoke distribution is not uniform – either in horizontal and vertical – HRRR Smoke shows this well
    - Nearby fires – smoke under inversion
    - Distance – generally above inversion but can mix down far downstream – MN event
  - Impacts a number of forecast variables
- Societal
  - Affect health – both near fire and distant – EPA and local Air quality
  - Aircraft operations
  - Fire Operations
  - CALOES - transportation – Amtrak and highways
  - National Park Systems
  - Recreational and school sports
  - Visiual
- Educational opportunity
  - People are curious and want to know where smoke is coming from/when is it going to get better

Bottom-line: HRRR-Smoke is a foundational science change that helps everyone